

## Claims

- [c1] 1. A silicon-based semiconductor microcircuit radiation hardening method comprised of:  
heating the microcircuit in a vacuum furnace to remove any hydrogen in the microcircuit structure; and  
annealing the microcircuit with deuterium containing forming gas.
- [c2] 2. The radiation hardening method of claim 1, wherein the microcircuit is heated in a vacuum for approximately 1 hour at between 400 and 700 ° C.
- [c3] 3. The radiation hardening method of claim 2, wherein the microcircuit is heated in a vacuum of  $10^{-6}$  torr or less.
- [c4] 4. The radiation hardening method of claim 3, wherein the microcircuit is annealed in deuterium-containing forming gas for about 30 minutes at about 400 ° C.
- [c5] 5. The radiation hardening method of claim 3, wherein the microcircuit includes MOSFET devices.
- [c6] 6. The radiation hardening method of claim 3, wherein the microcircuit includes EEPROM devices.
- [c7] 7. A radiation hardened silicon-based semiconductor microcircuit prepared by a process comprising the steps of:  
fabricating the microcircuit using standard techniques of silicon-based microelectronics up to the step of passivation using a forming gas anneal;  
heating the microcircuit in a vacuum furnace to remove any hydrogen in the microcircuit structure; and  
annealing the microcircuit with deuterium containing forming gas.
- [c8] 8. The radiation hardened semiconductor microcircuit of claim 7, wherein during the heating step, the microcircuit is heated in a vacuum for approximately 1 hour at about 500 ° C.
- [c9] 9. The radiation hardened semiconductor microcircuit of claim 8, wherein

during the heating step, the microcircuit is heated in a vacuum of  $10^{-6}$  torr or less.

- [c10] 10. The radiation hardened semiconductor microcircuit of claim 9, wherein the microcircuit is annealed in deuterium-containing forming gas for about 30 minutes at about 400 ° C.
- [c11] 11. A radiation hardened silicon-based semiconductor microcircuit prepared by a process comprising the steps of:  
fabricating the microcircuit using standard techniques of silicon-based microelectronics up to the step of passivation using a forming gas anneal;  
and  
annealing the microcircuit with deuterium-containing forming gas.
- [c12] 12. A radiation hardened silicon-based semiconductor microcircuit prepared by a process comprised of fabricating the microcircuit using standard techniques of silicon-based microelectronics except that deuterium is substituted for hydrogen in any fabrication step that involves hydrogen gas or hydrogen-containing species.